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The Patent Office

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1. Your reference

   W0102

2. Patent application number
   (The Patent Office will fill in this part)

   23 DEC 1998 **9828333.6**

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

   CROWN CORK & SEAL TECHNOLOGIES CORPORATION
   11535 S CENTRAL AVENUE
   ALSIP
   ILLINOIS 60803-2599
   USA

   Patents ADP number *(if you know it)*

   If the applicant is a corporate body, give the country/state of its incorporation

   UNITED STATES/ DELAWARE

   7372170001

4. Title of the invention

   RINSING DEVICE

5. Name of your agent *(if you have one)*

   DEBRA JANE CLARE SMITH

   "Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

   CARNAUDMETALBOX PLC
   DOWNSVIEW ROAD
   WANTAGE
   OXFORDSHIRE
   OX12 9BP

   Patents ADP number *(if you know it)*

   6264816002

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Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*
-	-	-

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application		Date of filing *(day / month / year)*
-	-	-

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*
   a) any applicant named in part 3 is not an inventor, or
   b) there is an inventor who is not named as an applicant, or
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   See note (d))

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Continuation sheets of this form	-
Description	14 ✓ 88 H
Claim(s)	3
Abstract	1
Drawing(s)	3 + 3

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Priority documents	-
Translations of priority documents	-
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	-
Request for preliminary examination and search *(Patents Form 9/77)*	YES ✓
Request for substantive examination *(Patents Form 10/77)*	-
Any other documents *(please specify)*	-

11. I/We request the grant of a patent on the basis of this application.

Signature Debra J C Smith Date

DEBRA JANE CLARE SMITH 22/12/98

12. Name and daytime telephone number of person to contact in the United Kingdom

MISS SMITH : 01235 402656

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RINSING DEVICE

The present invention relates to rinsing devices for multi-stage cleaning of containers. In particular, the invention provides a rinser suitable for removing forming lubrication and gear oil from cans after their manufacture.

The can forming process is a "wet" process. The cans are lubricated during the various forming operations and therefore have to be cleaned before they can be coated or filled. Cleaning of the newly manufactured cans is carried out in a number of stages, usually commencing with rinsing the cans in water and finishing with rinsing in de-ionised water. The number of cleaning stages varies, depending upon the material from which the can is made and the finishing processes to be applied to the cans, such as etching, coating etc.

Existing rinsing devices comprise a plurality of washing and associated drying stages through which the cans are transported on a conveyor belt. The cans are inverted, with their open ends in contact with the belt. The belt is provided by an open-work mat which allows the cleaning solution to be sprayed into and drain from the cans. As the cans pass through the washing stages of the device, high pressure nozzles spray cleaning solution (for example, water) onto the insides and outsides of the cans. After each washing stage, the cans pass into the associated drying stage of the rinser where they are dried by air nozzles or air knives directed onto the passing cans. The cleaning fluid drains from the cans through the holes in the conveyor belt.

There are a number of disadvantages with existing rinser designs. As the washing and drying stages are generally arranged linearly, along a conveyor belt, and there are usually a number of such washing and drying stages, the rinsing apparatus tends to occupy a large amount of space. Furthermore, as the conveyor belt passes through the washing and drying stages with the cans, the belt has to be washed and dried during each stage of the process, in addition to the cans, to prevent cross contamination in adjacent stages of the rinser. Finally, the spray nozzles and air nozzles are impeded from reaching the insides of the cans by the mat on which the cans are carried. The mat also restricts drainage of the cleaning fluid from the cans.

Accordingly, the present invention provides a rinsing device comprising a plurality of rinse modules, each rinse module having a washing stage and a drying stage, and a carrier means for transporting containers through the rinse modules, characterised in that each rinse module has an independent carrier means, arranged to transfer the containers from one carrier means to the next at the end of each rinse module.

As in the prior art, the rinsing device according to the invention comprises a plurality of washing and associated drying stages and a carrier for transporting containers, such as cans for example, through the various stages. The drying stages minimise the amount of moisture carried by the containers and therefore reduce cross contamination as the containers pass from one washing stage to the next. However, the rinsing device according

to the invention is divided into rinse modules and separate carriers are provided in each rinse module. The containers are transferred between carriers each time they pass from one module into the next. This arrangement has the advantage that the potential for cross contamination between rinse modules is reduced as the carrier does not pass from one module to the next.

In a preferred embodiment of the invention, a rinse module comprises a washing stage and a drying stage, both of which are provided with separate carriers. This has the advantage that the carrier in the drying stage remains substantially dry, as only the wet containers are transferred from the washing stage to the drying stage of the rinse module. The carrier in the drying stage is not subjected to the spray of cleaning fluid. Thus, the carrier in the drying stage does not have to be dried by the air knives and the containers can be dried more quickly and effectively than in conventional rinsers.

Preferably, each carrier comprises a circular turret in which the containers are mounted in an inverted position, with their open ends pointing downwards to allow drainage of cleaning fluid, under the effect of gravity. The containers are supported around the periphery of the turrets, with as little obstruction of the opening of the container as possible. Mounting the containers in this way, improves access for the spray nozzles and air knives, used to wash and dry the containers respectively. Drainage of cleaning fluid from the containers is also largely unimpeded.

Preferably, the containers are supported in the turrets between freely rotatable mandrels, around the periphery of the turret, and stationary guide rails suitably spaced from, but following the contour of the circumference of turret. In this arrangement, the turret is provided with a number of pockets, defined by adjacent mandrels, with the containers supported in the pockets. The turret is rotated so that the containers are carried past suitably arranged spray nozzles and air knives in the washing and drying stages respectively. Preferably, the guide rails are arranged to apply a slight pressure between the containers and the inner mandrels, so that the containers rotate about their longitudinal axis as they move past the spray nozzles and air knives on the rotating turret. Alternatively, the rotation of the mandrels may be driven, thereby driving rotation of the containers about their longitudinal axis.

Preferably, the contact points on the mandrels and guide rails (where they touch the containers) are made from a low absorbency, non-marking material, such as polyethylene. Contact between the container and the mandrels is minimised by providing rings of material around the circumference of the mandrels, in the form of O rings for example. Preferably, the material on the contact surface of the guide rails provides sufficient frictional contact with the containers that it "drives" rotation of containers about their longitudinal axis as they are carried along the guide rail by the rotating turrets.

At the transfer points from one turret to the next, the guide rails are arranged to ensure that the containers are transferred between turrets. As the risk of container jams is highest at these transfer points, the guide rails are preferably adapted to provide access to the turrets in this area, to allow removal of any jam. Access to the pockets at the transfer points may be provided, for example, by a spring loaded portion of the guide rail which can be opened by an operator to reveal the pockets.

In a preferred embodiment of the invention, the rinse modules are arranged with the circular turrets in a generally vertical configuration, with the principal plane of each turret is at an angle of 0° to 45° to the vertical. This arrangement provides an extremely compact unit which takes up much less floor space than conventional rinsers. For straight sided containers, the principal plane of the circular turrets is preferably at an angle of about 15° to the vertical with the open ends of the containers pointing towards the floor. Mounting of the turrets at this angle ensures that any cleaning fluid is able to drain from the containers under the affect of gravity, whilst retaining a compact unit.

To obtain the most compact unit, the turrets should be mounted with their principal plane vertical but this arrangement would not provide sufficient drainage of cleaning fluid from the containers. For maximum drainage of cleaning fluid, the turrets should be mounted with their principal plane horizontal and the opening of the containers pointing towards the floor, but this obviously

takes up more floor space. However, the applicants have determined that considerable space savings can be made by mounting the turrets generally vertically, whilst a slight angle of about 15° to the vertical ensures sufficient drainage of cleaning fluid from a straight sided container such as a can. Obviously containers having shaped sides or significantly reduced neck diameters may require the turrets to be mounted at a greater angle to the vertical, to ensure adequate drainage.

In the washing stages of the rinsing device, cleaning fluid (such as water, de-ionised water or detergents) is sprayed onto the passing containers by spray nozzles mounted along the path of the carrier. Preferably, de-ionised water is used as the cleaning fluid in the last rinse module to ensure that the containers are not smeared or streaky as they leave the rinser. In the preceding rinse modules, water may be used as the cleaning fluid, sprayed onto the containers at high pressure from the spray nozzles. Preferably, the waste cleaning fluid from each rinse module is collected in an associated reservoir and is used to supply spray nozzles in the preceding unit. Thus, the containers are washed using progressively cleaner cleaning fluid as they move through the rinser. This arrangement reduces the water and or detergent consumption of the rinser device.

In a can making line, most of the contaminants on the cans are oil and grease. Where water is used as a cleaning fluid, these contaminants will tend to collect on the surface of the waste water reservoirs and may be

removed before the water is used in the spray bars of the rinse modules. Floating contaminants may be removed, for example, using a simple weir arrangement. Preferably, the reservoir tanks are of a size which ensures that the water in the reservoirs is held for a sufficient period of time to allow solids to settle onto the base of the tank, before the water is recycled. Larger reservoir tanks also dilute any contaminants draining into the tanks from the rinse modules.

In the drying stages of the rinsing device, air nozzles or air knives are directed onto the passing containers to remove as much moisture as possible before they are transferred into the next rinse module. Preferably, a negative pressure is created inside one or more of the rinse modules, to remove vapour from the containers and keep them as clean as possible. For example, fans may be provided in ducting from the rinse module to extract vapour from that module.

The rinse modules may be provided with the washing stage, the drying stage and carrier means pre-arranged within the module. For example, where the washing and drying stage have separate carriers in the form of circular turrets, the turrets and guide rails may be aligned within the rinse module and fixed in this orientation to ensure smooth transfer of the containers between the turrets. This allows the rinsing device to be set up with any number of rinse modules connected together, using one module as a datum against which the other modules can be aligned. This arrangement also

allows simple replacement of a rinse module where necessary.

Preferred embodiments of the invention will now be described, by way of example only, with reference to the drawings, in which:

Figure 1 shows a block diagram of one embodiment of the rinsing device according to the invention, showing the flow path of the water, air and cans through the rinser.

Figure 2 shows a plan view of the principle plane of the circular turrets in a rinse module according to one embodiment of the invention.

Figure 3 shows a side view of the turrets shown in Figure 2, mounted in a substantially vertical configuration within a rinse module.

Referring to figure 1, a rinsing device according to a first embodiment of the invention, comprises three rinse modules 1, 2, and 3 and a pre-rinse module 4. Each of these modules comprises a washing stage 11, 21, 31, 41 and a drying stage 12, 22, 32, 42.

Each rinse module 1, 2, 3 is also provided with an associated reservoir tank 13, 23, 33. Preferably the reservoir tanks 13, 23, 33 have a large volume (about 2000 litres for example) to allow good flow balancing and to dilute contaminants and allow solid particles to settle onto the base of the tanks. The main contaminants from the washing of cans are oils and grease, which tend to float on the surface of tanks. Therefore, each tank 13, 23, 33 is provided with a weir 16, 26, 36 providing an overflow from the surface of the tank at a flow rate of about 1 litre per minute. The flow rate of the

overflow may be controlled by manual inspection and a simple ball valve arrangement. Alternatively, the overflow flow rate may be controlled automatically via a penstock and flow measurement device. The overflow from tanks 13, 23, 33 drains into the common effluent drain within the factory.

Cans are delivered to the rinser at variable speeds between 220 and 405 cans per minute. The rinser speed is matched to the can bodymaker speed +/- modulation speed using sensor control on the infeed to the rinser.

The cans enter the pre-rinse module 41 and are transported through this module on a carrier. As the cans pass through the washing stage 41, wash medium (normally water) at low pressure (about 2-3 barG), is sprayed onto the surfaces of the cans at a flow rate of about 10-30 litres per minute, preferably about 25 litres per minute. The spray nozzles in washing stage 41 are supplied from the reservoir tank 13, via the low pressure pump 14.

The cans then pass into the drying stage 42 where air blowers are directed onto the cans to dry as much moisture from them as possible. The waste wash medium is allowed to drain, by gravity, from the pre-rinse module 4 into a common effluent drain within the factory.

Next, the cans are transferred to another carrier and are transported through rinse module 1. As the cans pass through the washing stage 11, wash medium at high pressure (about 20-70 barG) is sprayed on to the surfaces of the cans at a flow rate of about 100 - 130 litres per minute and a temperature of 85°c maximum. The high pressure spray nozzles in washing stage 11 are supplied

from the reservoir tank 13, via the high pressure pump 15.

At the end of washing stage 11, the cans enter a low pressure part of the wash cycle, where they are sprayed with wash medium at low pressure (about 2-3 barG) and a flow rate of about 10-30 litres per minute, preferably about 25 litres per minute. The low pressure spray nozzles are supplied from reservoir tank 23, via the low pressure pump 24. This final, low pressure part of the washing cycle, is supplied with wash medium from reservoir tank 23, associated with rinse module 2, to ensure that any moisture remaining on the cans when they enter rinse module 2 is as clean as the wash medium used in that rinse module.

The cans then pass into the drying stage 12 where air blowers are directed onto the cans to dry as much moisture from them as possible. The waste wash medium from rinse module 1 is allowed to drain, by gravity, into reservoir tank 13.

Next, the cans are transferred to another carrier and are transported through rinse module 2. As the cans pass through the washing stage 21, wash medium at high pressure (about 20-70 barG) is sprayed on to the surfaces of the cans at a flow rate of about 100 - 130 litres per minute and a temperature of 85°c maximum. The high pressure spray nozzles in washing stage 21 are supplied from the reservoir tank 23, via the high pressure pump 25.

At the end of the washing stage 21, the cans enter a low pressure part of the wash cycle, where they are

sprayed with wash medium at low pressure and a flow rate of about 10-30 litres per minute, preferably about 25 litres per minute. The low pressure spray nozzles are supplied directly from the factory supply. This low pressure part of the washing cycle uses water from the factory supply to minimise the contaminants in the moisture remaining on the cans when they enter rinse module 3. The factory supply is also used for fluid make up within the reservoir tanks 13, 23.

The cans then pass into the drying stage 22 where air blowers are directed onto the cans to dry as much moisture from them as possible. The waste wash medium from rinse module 2 is allowed to drain, by gravity, into reservoir tank 23.

Finally, the cans are transferred to another carrier and are transported through rinse module 3. As the cans pass through the washing stage 31, de-ionised water at low pressure (about 4 barG) is sprayed on to the surfaces of the cans at a maximum flow rate of about 65 litres per minute.

The cans then pass into the drying stage 32 where air blowers are directed onto the cans to dry as much moisture from them as possible. The waste water from rinse module 3 is allowed to drain, by gravity, into reservoir tank 33. The water from reservoir tank 33 is recycled to the factory supply via pump 34, at a flow rate below that of the de-ionised water supplied to the spray nozzles in washing stage 31 (at about 60 litres per minute, for example).

Rinse modules 1, 2 and 3 are preferably identical and adaptable, to allow interchangeability with other modules. The modules are arranged to allow a fluid sealed connection of additional rinse modules at the infeed or discharge end of the modules. This arrangement provides a flexible system which can easily be expanded to provide additional washing stages where required. Furthermore, rinse modules can easily be removed and replaced where necessary.

Referring to figures 2 and 3, a rinse module according to a preferred embodiment of the invention comprises two circular turrets 80, 90 which provide the carrier means through the washing stage and drying stage respectively. Cans are directed onto the infeed of the washing turret 80 by means of guide rails 60 on the infeed of turret 80. A plurality of freely rotatable mandrels 50 are arranged around the perimeters of turrets 80 and 90. The cans 70 are held in pockets defined between adjacent mandrels 50. A stationary guide rail 60 is arranged spaced from but following the contour of the circumference of each turret 80, 90. The spacing of the guide rail 60 from the turret 80, 90 is sufficient to maintain the can 70 within the pockets defined by adjacent mandrels 50 whilst providing sufficient friction so that as the turrets rotate, the cans 70 are rotated about their longitudinal axis as they move past the stationary guide rail 60. The rotation of the cans 70 is accommodated by rotation of the mandrels 50 about their longitudinal axis.

As the cans 70 move around the periphery of the turret 80, they are sprayed by a series of spray nozzles (not shown) which are arranged to spray wash medium over the internal and external surfaces of the cans 70. The cans 70 are then transferred onto the drying turret 90 by means of the guide rails 60. As this transfer point is the area where most can jams are likely to occur, the guide rails 60 at this point are provided with a spring loaded, hinged portion 65 which may be opened by an operator to provide access to the turrets 80, 90 at the transfer point.

Once transferred to the drying turret 90, the cans are again supported within pockets defined between adjacent mandrels 50 and an outer guide rail 60 which follows the contour of the circumference of the turret 90. As the cans move around the periphery of the drying turret 90, they are acted upon by a series of air blowers or air knives (not shown) which are arranged to remove as much moisture as possible from the cans 70.

As shown in figure 3, the circular turrets 80, 90 are preferably arranged with their principal plane at an angle of 15° to the vertical and with the open ends 71 of the cans 70 pointing towards the floor. This arrangement reduces the amount of floor space occupied by each rinse module whilst ensuring adequate drainage of cleaning fluid from the cans, under the effect of gravity. The cans 70 are supported by the mandrels 50 and the guide rails 60 with as small contact surfaces as possible. Furthermore, the open end 71 of the can is not restricted by the support means.

The guides, spray bars and mandrels are preferably mounted using quick release mechanisms to ensure ease of maintenance. The drive system for the turrets may be provided by a belt pulley system, servo's, chains, gears or other suitable alternative. Finally, to provide a compact unit, the rinse modules may be mounted on top of their respective reservoir tanks.

The control system used to detect the movement of cans through the rinsing device is the same in each rinse module. The control systems in all rinse modules are integrated to allow the movement of cans to be tracked as they pass through the various modules of the rinsing device.

CLAIMS

1. A rinse module comprising a washing stage, a drying stage and a carrier means for transporting containers through the rinse module,
characterised in that
the washing stage and drying stage each have an independant carrier means, arranged to transfer the containers from one carrier means to the next at the end of the washing or drying stage.

2. A rinsing device comprising a plurality of rinse modules, each rinse module having a washing stage and a drying stage, and a carrier means for transporting containers through the rinse modules,
characterised in that
each rinse module has an independent carrier means, arranged to transfer the containers from one carrier means to the next at the end of each rinse module.

3. A rinsing device according to claim 2, comprising a plurality of rinse modules according to claim 1.

4. A rinsing device according to claim 2 or claim 3, wherein each carrier means comprises a circular turret, support means to support the containers in an inverted position around the periphery of the turret and guide means to assist transfer of the containers from one turret to the next.

5. A rinsing device according to claim 4, wherein the turrets are rotated to transport the containers

through the washing and drying stages and transfer the containers from one turret to the next.

6. A rinsing device according to claim 4 or claim 5, wherein the support means comprises a plurality of rotatable mandrels which define pockets within which the containers are mounted.

7. A rinsing device according to claim 6, wherein the support means further comprises a stationary, peripheral guide rail and the containers are supported between the guide rail and the mandrels, within the pockets.

8. A rinsing device according to claim 7, wherein the guide rail is arranged so that the contact between the guide rail, the containers and the mandrels is sufficient to rotate the containers about their longitudinal axis as they are transported around the periphery of the turret.

9. A rinsing device according to any one of claims 4 to 8, wherein each circular turret is arranged with its principal plane at an angle of between 0° and 45° to the vertical.

10. A rinsing device according to claim 9 wherein each circular turret is arranged with its principle plane at about 15° to the vertical.

11. A rinsing device according to any one of claims 2 to 10, wherein each washing stage comprises a plurality

of spray nozzles, to spray cleaning fluid onto the surfaces of the container.

12. A rinsing device according to claim 11 wherein the waste cleaning fluid from each rinse module is used to supply spray nozzles in the previous rinse module.

13. A rinsing device according to claim 11 or claim 12, wherein the cleaning fluid in the final rinse module is de-ionised water.

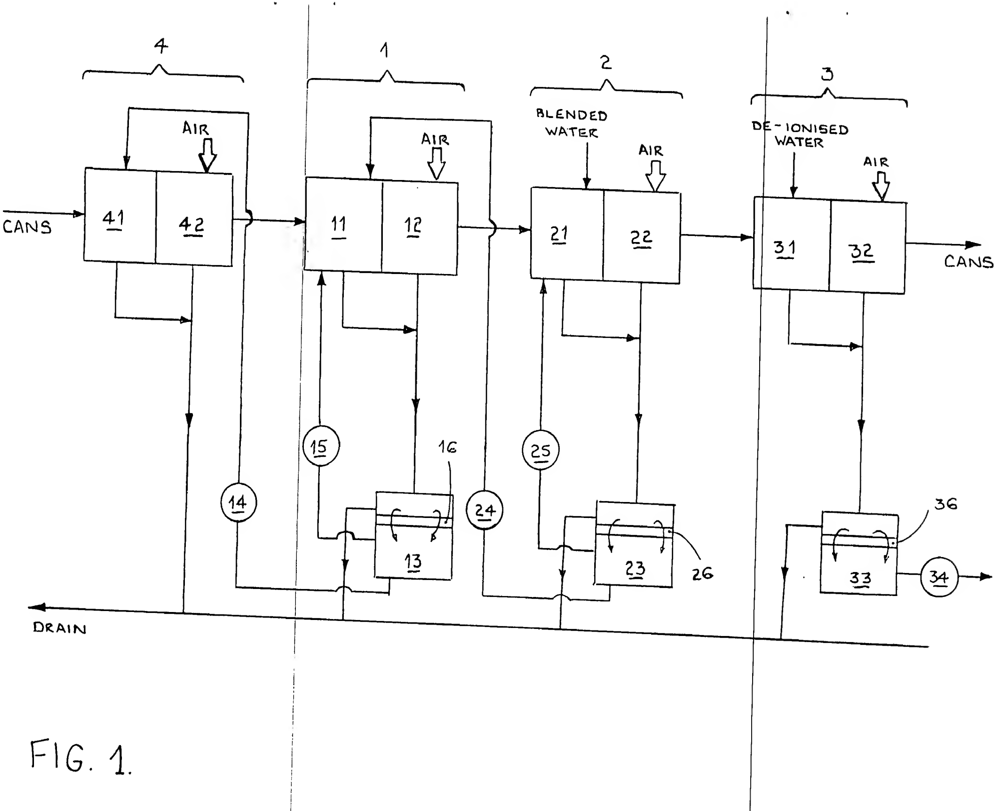
14. A rinsing device according to any one of claims 2 to 13, wherein each drying stage comprises a plurality of air knives arranged to dry the containers.

15. A rinsing device according to any one of claims 2 to 14, wherein a negative pressure is created inside at least some of the rinse modules to improve drying of the containers.

<u>ABSTRACT</u>

A rinsing device having a number of rinse modules, each of which has a washing stage and a drying stage, and a carrier means for transporting containers such as cans through the rinse modules. Independent carrier means are ~~provided in each rinse module and the containers are~~ transferred from one carrier means to the next when they pass into the adjacent rinse module. Preferably the carriers are turrets which are arranged vertically to minimise the floor space occupied by the rinser.

FIGURE 2


4
1
2
3
AIR
AIR
BLENDED WATER
AIR
DE-IONISED WATER
AIR
CANS
41
42
11
12
21
22
31
32
CANS
15
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25
14
24
36
13
23
26
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34
DRAIN

FIG. 1.

FIG. 2

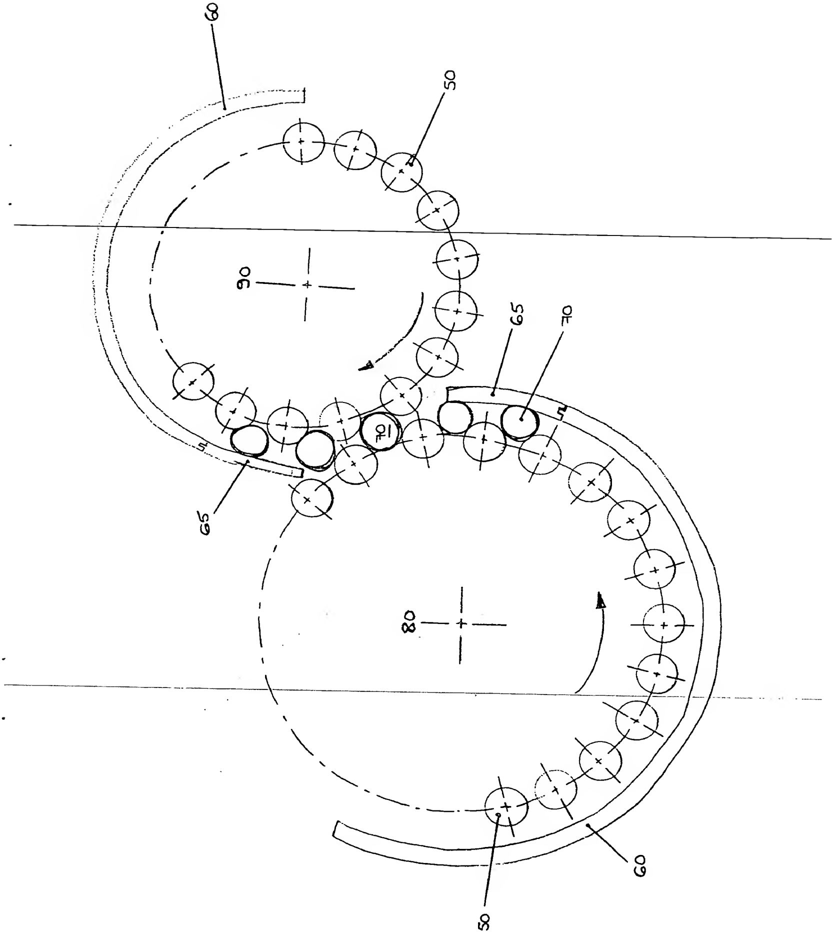
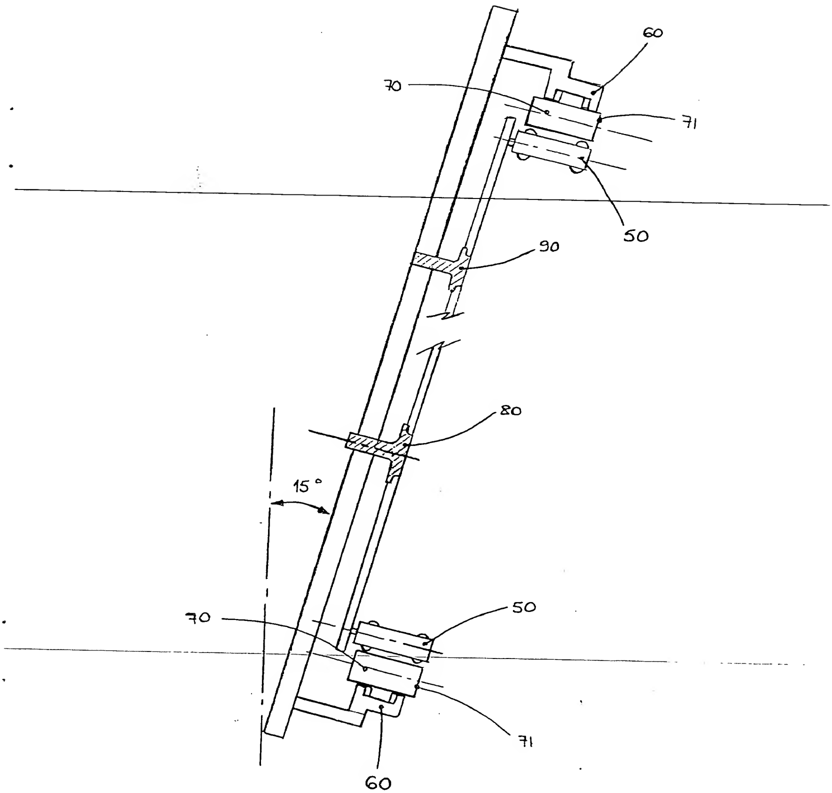


FIG. 3



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